Panoramic Stereoscopic Video System for Remote-Controlled Robotic Space Operations, Phase I

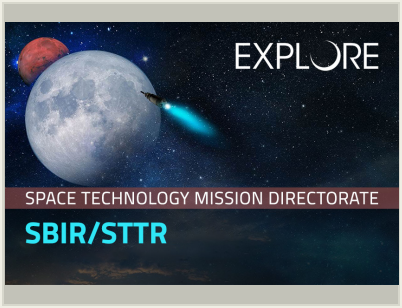
Completed Technology Project (2004 - 2004)

Project Introduction

This Phase I project will demonstrate the feasibility of providing panoramic stereoscopic images for remote-controlled robotic space operations using three fixed-position cameras. Remote-controlled robot operations are an important element in orbital and planetary space missions. Advanced display systems can greatly enhance the effectiveness of these operations. In the system proposed here, human operators will be immersed in a virtual environment composed of a mosaic of stereoscopically encoded images. The operators will readily view 3-dimensional images of the robot?s workspace over a full hemisphere. The panoramic stereoscopic imaging will be achieved through an innovative optical design, employing three of NASA?s Panoramic Refracting Optics, each providing a hemispherical view to one camera. The proposed system will be simple, lightweight, energy efficient, and will contain no moving parts. It will therefore be compatible with space launch and environmental requirements. The proposed system will increase the effectiveness of NASA?s robotic operations during orbital and planetary missions, and directly addresses the subtopic need to ?improve the robotic teleoperator?s efficiency through advanced display systems.?

Anticipated Benefits

The non-NASA applications are also numerous. Remote-controlled robots are often used in inhospitable work environments, such as in the disposal of bombs, the handling of radioactive materials, and the handling of objects in inert/vacuum environments. The lack of moving parts in the imaging system and the ability to seal it against contamination are features that make it ideal for many of these applications. Surveying applications also abound in the commercial/private sector, where the system could be mounted to robots and used in operations such as search and rescue (e.g. in collapsed structures), crime scene searches, and terrain or cavern mapping. The product of Phases I and II will find numerous applications in NASA programs. The hemispherical stereoscopic viewing can be utilized in any situation where human operators are remotely operating equipment. This includes the operation of remote controlled robots and the maneuvering of spacecraft during docking operations. Other applications for the imaging system will be in planetary exploration, where the proposed imaging system will be compact and rugged enough to be carried by rovers during surveying missions. The system will enable operators or image processing algorithms to quickly locate objects or locations of interest without using a rotating camera mount.



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Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Center / Facility:

Johnson Space Center (JSC)

Responsible Program:

Small Business Innovation Research/Small Business Tech Transfer

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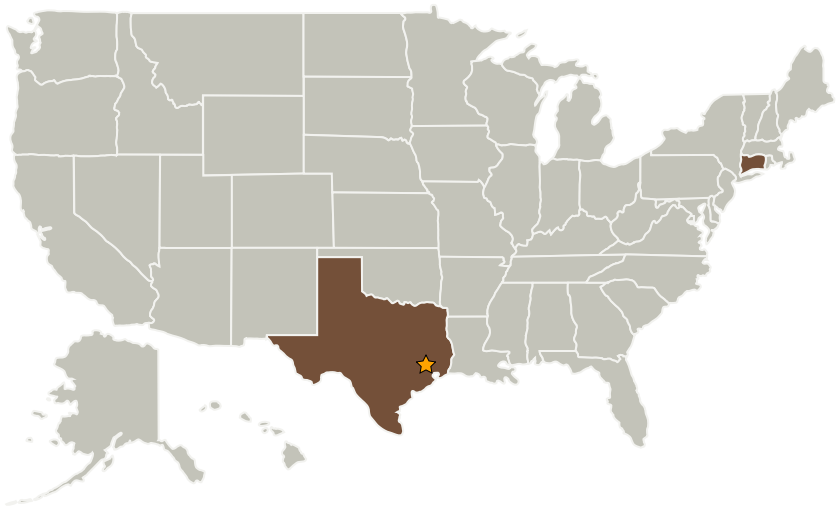
Primary U.S. Work Locations and Key Partners



Organizations Performing Work	Role	Type	Location
★Johnson Space Center(JSC)	Lead Organization	NASA Center	Houston, Texas
Advanced Fuel Research, Inc.	Supporting Organization	Industry	East Hartford, Connecticut

Primary U.S. Work Locations	
Connecticut	Texas

Project Management

Program Director:
Jason L Kessler

Program Manager:
Carlos Torrez

Project Manager:
Darby F Magruder

Principal Investigator:
James J Scire

Technology Areas

Primary:

- TX05 Communications, Navigation, and Orbital Debris Tracking and Characterization Systems
  - TX05.1 Optical Communications
    - TX05.1.2 Large Apertures